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Succulents

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WHEN the term "succulent" is used it immediately brings to mind something that is juicy, and that is exactly what the word means. It is derived from the Latin *succulentus*, meaning juicy, pulpy, and thus is an apt term to describe plants with juicy stems, branches, or leaves. However, not all juicy or pulpy plants are considered succulents. For instance, Begonias possess fleshy stems and leaves but usually they require a great deal of moisture to keep them alive. A true succulent is a plant which has fleshy leaves and stems of greater thickness than the average serving as storage organs for water, thus enabling the plant to withstand prolonged periods of drought.

Succulent plants are frequently associated with deserts, as the place of their abode. Webster defines a *desert* as an arid region lacking moisture to support vegetation. "A desert is not only relatively uninhabitable, but commonly uninhabitable, through barrenness." There are many vast regions on this globe of ours which answer to this description. Familiar examples are the Sahara in Africa and the Gobi in Asia, where hardly any vegetation of any kind exists. However, there is still another type of desert, or better, semi-desert, which is inhabited by miscellaneous plant life. The deserts in our own Southwest and in Mexico, the Canary Islands and South Africa are of this type. These semi-deserts support a host of annuals, low thornbushes and many plants of succulent habit. The annuals are short-lived and often complete their life cycle (seed to plant to seed) within a year—many doing so between rains which are infrequent. The thorny shrubs, such as Mesquite and Retama, exist only because they send their roots deep into the soil, often 15 feet or more, where moisture always is present. The remainder of the plants are able to survive due to their ability to store moisture in their stems, their leaves or in underground tubers. These plants, as a group, are called succulents.

In addition to deserts or semi-deserts there are many dry regions such as the Alps, the Himalayas and the Andes, as well as parts of the Arctic, and many other regions, which support succulent plants, but where the drought conditions are caused by rarefied atmosphere, scarcity of soil, rapid drainage of water, cold, and other factors.

Succulents are not limited, however, to the dry regions of the world. Many succulents are native to Missouri, for example, and the sections of the world that are not considered dry. In many areas the micro habitat of succulent plants will be hot and dry, such as would be found on glades or rocky hillsides throughout much of the growing season.

However, the greatest concentration of bizarre succulents is in the deserts,

for their peculiar ability to store great quantities of water is of course most valuable there. It is these bizarre plants that are most attractive to collectors and which are responsible for such organizations as the Cactus and Succulent Societies.

Succulents on the whole are not deep rooted. Many possess a root system which spreads greatly just under the surface of the soil or in tangled masses in fissures of rocks. They are able to absorb moisture fast when it becomes available and to retain it for long periods in their plump or succulent bodies. The degree of succulency is what makes some of these plants so bizarre and grotesque, particularly the cacti and spurges. Water is held in the extra cells of the leaves and stems by various protective devices to hold down transpiration which would be high in a hot and dry atmosphere. A thickened organ has less surface exposed to the air than a thin, flattened one of the same bulk. Thus the plump forms typefied in succulents reduce surface and lessen water loss by evaporation. The ribbed, fluted, or tubercled stems of cacti, for instance, allow for expansion and contraction during periods of water abundance and of drought. Thick waxy skins, best exemplified in cacti, cover most of the succulents. In others, such as the Crassulaceae, the thick leaves are covered with a bluish waxy powder as in *Dudleya pulverulenta* and *Echeveria gibbiflora*, and with an abundance of hairs, felt or wool, as in *Kalanchoe tomentosa*, *Crassula tecta* and *Echeveria pulvinata*.

In a typical desert where the sun beats down unmercifully throughout the year, a preponderance of succulents can be found. The buttes and high mountains in such regions also support a great number of succulents and it is often mystifying how so many monstrous growths can thrive on the steep and arid slopes which are buffeted by strong winds. Farther up the slopes the succulents become stunted in the rarefied air and become more or less cushion-like or carpeting in habit, true of many Sedums and Sempervivums.

In the United States there are many semi-arid regions; those best known are in Texas, New Mexico, Arizona, Colorado, Utah and California—the Great Southwest. The characteristic plant of the Great Southwest is the *cactus*. It is, in fact, the dominant succulent in American deserts, often attaining tremendous proportions. Certain species of the *Cereus* group grow to fifty feet; and, with their innumerable water-filled branches, they weigh several tons. The greatest concentration of cacti is found in Mexico where more than 900 species exist. Giant cacti are also found in Peru, Ecuador, Bolivia, Brazil, Argentina and Chile. Companions of the cacti in American deserts are the Yuccas and Agaves, which also attain great size. Although they are more aptly classed as *xerophytes* rather than succulents, they generally are included in the latter category. A xerophyte is a plant which exists under conditions of great dryness. The means by which it is able to do so may or may not be succulency, so not all xerophytes are succulents.

South Africa is probably home to

more different kinds of succulents than is any other region on this globe. In the very hot dry South African deserts where the rocky or sandy soil is extremely poor only plants capable of adapting themselves to such unfavorable conditions can survive and thrive. Yet here grow some of the daintiest succulents known, many of them so tiny that they are easily overlooked. Here also grow the Euphorbias, or Spurges, which greatly resemble the cacti but which are related to the Poinsettia. Some of these desert plants become enormously tall and bulky while others grow in cushion-like or mound-like shapes. The ground is often covered with shrubby Mesembryanthemums or Fig-Marigolds with colorful daisy-like blossoms of every imaginable hue. Stapeliads may be found growing in the shade of low scrub. The Cape Region is conspicuous with Euphorbias and Aloes, the latter frequently growing in huge clumps which in the flowering season become decorated with brilliant spikes of tubular flowers.

The Canary Islands are noted for many beautiful succulents, particularly the remarkable Aeoniums belonging to the Crassulaceae. Some of the species have stout woody stems surmounted by large rosettes of leaves. These plants do exceptionally well in California and many gardens there feature them. Some of the rosettes are as big as pie plates and flat as table tops.

CULTURE AND CARE

Succulents lend themselves admirably as house plants. Of course they will do better if housed in a greenhouse because conditions therein are more ideal—due to better light, freer flow of air, more stable temperature, and other factors. In the greenhouse shading is not necessary although a light shade is preferable in the summer months. It is to be remembered that a good number of the *leaf succulents* do get partial shade since, in nature, they grow under thorny scrub or in the protection of rocks. Succulents exhibiting the thorniest armament, such as the cacti, *Ferocactus* and *Echinocactus*, and the spurges, *Euphorbia*, usually indicate the nature of their habitat—the hottest, driest and most sun-parched portion of the desert.

There are a number of shading compounds on the market which can be sprayed on the glass roof of a greenhouse. Some are easily prepared with water and form an even coating on the glass. Linseed oil can be added to make a permanent shade.

CONTAINERS:

Clay pots are preferred by the hobbyist for succulent plants. Since clay pots are porous, water as well as air can pass through them. On the other hand, ceramic pottery, although attractive, does not permit water and air to move through the soil and if these containers are used by the grower, care must be exercised not to overwater as that will cause "sour" soil to form. Glazed pottery does serve a

decorative purpose and the use of it is not discouraged; although it is efficient as a temporary container at best, unless used as an outside pot with a loosely fitting clay pot within.

Succulents, as a rule, do much better in a size-smaller pot than would be used for an ordinary house plant. The more vigorously growing plants will require transplantings to successively larger pots. The slow growing kinds can remain in the same container indefinitely, although transplanting or at least renewing of soil would be beneficial about every third year. One should study his plants' needs and conclude the type and size container each plant will require. Aloes and Agaves are examples of strong-growing plants with an abundance of roots. On the other hand, Gasterias, Haworthias, Stapelias and stemless Mesembs require very shallow pans. Most succulents will thrive in standard clay pots for a number of years.

POTTING SOIL:

Succulents will thrive in a more or less porous soil. Good old compost, well-rotted leafmold and sand are the ingredients necessary and, when mixed in equal amounts, provide a good medium for most succulents. It is the easiest to make or obtain. A heavy soil is usually detrimental to the root system as it becomes waterlogged more easily and causes the roots to rot. Many cacti and some of the other succulents welcome the addition of lime in the form of old rubble from buildings. Manure can also be added to the mixture to provide nourishment. Fertilizers with high content of nitrogen should be avoided. Do not use the real fine sand such as is sold in pet shops for aquariums because it packs too much. Clean, coarse river sand is ideal. When potting up large plants such as cacti, Euphorbias, Aloes and Agaves use quite coarse soil with the addition of limestone chat, gravel or broken charcoal to it. This will provide for quick drainage. Fast and complete drainage is the key to successful growing of succulents.

TRANSPLANTING:

The use of new pots is always preferable, but old pots can be used if well washed inside and outside, and then dried. Place a few pieces of broken pot in the bottom of the container to aid drainage. In transplanting, should the roots have beome pot-bound, it is advisable to break off the pot with a sharp blow, instead of risking damage to the plant in trying to take it out. Try to take out the plant with its ball of earth, carefully removing the pieces of broken pot at the bottom so as not to injure the roots. Replant just as deep down as it was in its previous container and sift fresh soil all around the ball of roots, firming it with the thumb or a wooden tamper. If there was no ball of earth and the roots were quite loose, hold the plant in the pot with one hand and with the other sift soil between the roots, pressing down the earth all around the pot. When transplanting it is safer to use dry soil beneath and around the plant so that if any of the roots were damaged during the operation some time will be allowed for the wounded tissues to dry and heal. Withhold water for a day

or two or just keep the soil very moderately moist, in order to promote the formation of new roots. After new growth has started more water can be given freely.

WATERING:

Since smaller pots of succulents usually dry out considerably even in the greenhouse during the summer months, daily watering will be necessary. Pots on the windowsill will have to be watered daily during the growing season also; but the larger the pot the fewer waterings will be needed if the plants are well-soaked each time they are watered. If the collection is not too large, place the plants in a bathtub and let the water soak into the soil from the bottom. Such watering will usually suffice for a week or ten days. During the dormant or winter season, most succulents, especially the cacti, will require less water; and it is also recommended that the plants be kept in a cool place where the temperatures do not go below 45 degrees F. or above 55 degrees F. How to water plants correctly is the trickiest part of gardening. Examine the plants daily; if the soil is dry to the touch, water is needed; if the soil is damp, no water is needed.

FERTILIZING:

Most succulents make little demand on the soil for food and it is better to avoid fertilizers since they are not required if the soil is good, and their use will cause the plants to make abnormal growth, become distorted, and easy victims to rot. Nitrogenous fertilizers are *generally* not recommended but those with larger quantities of superphosphates may be used. During the growing season, seedling succulents usually respond to highly concentrated fertilizers like RA-PID-GRO (23-21-17), FOLIUM (20-20-20) and others, even though the nitrogen content in these is rather high. I have been using these fertilizers periodically on cacti, Crassulas, Haworthias and on almost all succulents with good success. The main thing is not to overdo it.

SUCCULENTS IN THE GARDEN

If at all possible all succulents should be placed outdoors during the summer in temperate climes. There are many ways to exhibit them in rock gardens, borders, or beds. They can be plunged in the soil with their pots or arranged in tiers on mounds, or stands or placed on improvised fence shelves, etc.

Good drainage, as mentioned before, is the secret of successful plant culture, especially in regions where the rainfall is normally too high in comparison with the natural home of the plants. A natural slope or an artificial mound, receiving a sufficient amount of sunlight, is an ideal location for hardy succulents. It is surprising how many hardy succulents there are. One can almost make a garden of them alone as a permanent adjunct to a yard, perhaps utilizing some of the most showy tropical kinds with them in the summer. When a garden is

planted beside a building there should be some means of protection from the run-off of rain from the roof. The cacti, in particular, contain a surprising amount of water within their bodies and excessive moisture only tends to induce rot.

The type of soil is also of utmost importance and should consist of rather coarse material composed of gravel, sand, garden soil (not clay), and well decomposed leafmold. To this can be added a little lime in the form of broken bits of limestone, powdered shells, etc.

HARDY SUCCULENTS:

The Sempervivums, commonly known as Houseleeks, prefer the crevices of rocks and rock walls, which afford opportunities for them to scramble hither and thither and which permit them to cover rock depressions with their small, grey-green rosettes. Once these plants are established in well drained soil and a sunny location, it requires very little care to keep them growing. *Sempervivum tectorum* is the best known of the group—a sturdy dark-green rosette with leaves tipped with a tinge of red. The oddest member is perhaps S. *arachnoideum* which grows in dense masses of dainty rosettes often completely covered by filmy webs spun by the plant itself. All of the Sempervivums are rosette-forming plants, propagating themselves by means of young shoots which spring from the base of older rosettes. The Sedums are the most typical of the hardy succulents grown in rock gardens and there are so many varieties commonly cultivated that very little will be said about them here. *Sedum sarmentosum* with its yellow-green foliage makes a dense carpet in a relatively short time, and the showy S. *spectabile* is an excellent border plant. *Sedum ternatum* can withstand considerable shade since it prefers rocky woods in its native habitat. One of the most delightful annuals is S. *pulchellum* with white or purplish blossoms.

The Talinums are the least known of the Purslanes (Portulacaceae) among gardeners, yet when used in a rockery they are excessively colorful. The plants somewhat resemble certain Sedums and grow from thickened rootstocks each Spring, producing pink- to rose-colored ephemeral blossoms throughout the summer season. *Talinum calycinum* is a lovely gem, native to the states west of the Mississippi. It has a long flowering period. *T. teretifolium* is an Eastern species almost identical with the preceding, although with smaller flowers, fruit, seed and leaves. The Talinums multiply rapidly and require a well-drained soil and a sunny location, since their flowers will open only in bright sunshine.

Yuccas are American plants but their popularity was known in Europe as early as 1675. The hardy Yuccas are low-growing in habit and have a cluster of gracefully curved to rigid narrow leaves shooting up from the ground. *Yucca filamentosa* is a very desirable species. At the Missouri Botanical Garden it is used effectively in corners of beds of annuals and perennials in the Linnaean garden. *Yucca glauca* is less frequently cultivated, yet it is highly ornamental with quite

narrow leaves and large, waxy, greenish-white blossoms. It is quite common on the plains of midwestern United States. *Hesperaloe parviflora*, a yucca-like plant from western Texas, is hardy in the St. Louis climate. It bears a slender flower stalk surmounted with reddish tubular flowers.

Of the hardy cacti, the Opuntias or Prickly Pear Cacti are the most familiar; they are characterized by broad flat green oval pads, which are covered with more or less evenly-spaced depressions containing sharp needle-like spines and cushions of short bristles, called glochids. The flowers are large and usually yellow, though some have reddish centers. The pincushion cacti, and these include *Coryphantha vivipara, Pediocactus Simpsonii* and three or four species of *Neobesseya,* are all of the hardiest nature, surviving winters even in our northern States. The Hedgehog cacti, belonging to the Echinocereus group, are short, cylindrical stemmed plants and the hardiest among them are *Echinocereus viridiflorus, E. Baileyi, E. Reichenbachii* and *E. coccineus.*

Certain cacti, due to their symmetry, can be made attractive in beds of the formal type but this kind of garden is usually possible only on large estates or recreational grounds. Circular or rectangular beds form the most pleasing designs and these should be slightly elevated towards the middle in order to insure good drainage for the plants. The best plants suitable for a formal design are the tropical Mammillarias, Malacocarpi, Notocacti, Gymnocalyciums and Parodias, since most of them have small globular to short cylindric bodies covered with a variety of colorful spines. When an odd assortment of cacti is to be used, arrange the larger species on the crest of the mound, graduating with the smaller ones toward the edges.

A rock garden need not be given

An impressive cactus garden in St. Louis. (All the plants must be taken indoors for the winter. Photo by Ladislaus Cutak.

Cacti and Succulents can be used effectively with other tropical plants as in this Florida garden. Photo by Ladislaus Cutak.

over strictly to cacti for these plants harmonize beautifully with other succulents and equally well with many other rock-loving plants.

A permanent cactus rockery is almost an impossibility in the colder sections of our country except in the southern states, yet there are a number of fascinating species such as those already mentioned that will live through severe winters. Many others from high altitudes are available but it must be remembered that only among the tropical kinds will be found the most ornamental types both as to flowers and stem structures. A planting of tropical cacti is practical in the Midwest but the plants must be brought indoors for the winter.

In the warmer regions of California, Texas and Florida cactus gardens are very popular and a visit to these sections will disclose many pleasing effects created by the use of the plants in foundation plantings. The peculiar Spanish architecture forms a fitting background for bristling Opuntias, columnar and branched Cerei, grotesque Euphorbias and bushy Aloes.

SUCCULENTS AS HOUSE PLANTS

Winter is the season of the year when house plants are perhaps more appreciated than at any other time. When cold weather descends to destroy the beauty of our summer garden, there is no need to go "dormant" on plant life. There are many kinds of house plants that can give and

continue to give enjoyment even though the outdoor life has gone to rest! Succulents, above all, please all year round because they always look attractive, healthy and radiant. Succulents lend themselves to house culture without any trouble. Some gardeners may not see any beauty in cacti and other succulents and question keeping them around the house. Of course, this depends entirely upon personal taste. Succulents are usually chosen because they can be grown with such ease. Few house plants require less care and give so much pleasure and satisfaction.

Cacti and succulents can be made attractive on shelves built into the window, or by any other method that appeals to the individual. Alcove windows and sunlit porches are the most ideal locations for growing desert plants in the home, yet it will surprise you to see what a fine lot of plants can be grown in the ordinary window. In the average home, small cacti readily lend themselves to many pleasing arrangements in the window garden, on a table or wherever a touch of interest is needed.

Desert plants need not be confined to pots alone. Small glazed novelty pottery, dishes and bowls, as well as terrariums are for these plants. The very diminutive novelty pots holding but a thimbleful of soil can support slender, tail like cacti for a surprisingly long time—two years at the least—but at best these containers are only adornments rather than serious attempts at growing healthy specimens. Bowls and dish gardens are more elaborate affairs and invite artistic ingenuity in combining rocks and plants to form a realistic desert scene in miniature. Desertariums are equally attractive, for they are nothing more than glass-enclosed deserts. Truly, they should excite admiration and interest because they are so decorative and different.

MAKING DESERTARIUMS AND DISH GARDENS:

A desertarium can be made easily, yet a certain amount of patience is required. Any clear glass enclosure, such as a bell jar or discarded aquarium will be suitable for the purpose. An inch of gravel should be placed in the bottom, then some pieces of charcoal added to keep the soil sweet and finally two or three inches of good porous soil as discussed under CULTURE, should be added. In planting, avoid overcrowding, use seedling plants about two or three inches high; and, wherever possible, rely on cacti primarily, since they will be more satisfactory than the tender-leaved Sedums, Mesembryanthemums, Crassulas, etc. After planting operations are performed, spread a thin layer of fine gravel on the surface of the soil. It will not be necessary to water immediately, if the potting soil is damp. The plants should not be watered for at least a week after planting. A glass cover placed over the opening at the top will prove beneficial for it will create condensation, especially in the summer season. If one regulates this operation, no watering need be given for weeks. The lid should never be kept on tight (except when condensation is desired to produce rain conditions), so as not to interfere with the

Dish gardens and terrariums.

circulation of fresh air in the miniature greenhouse. Avoid too much moisture, for this becomes an inducement for rot diseases and molds detrimental to successful glass gardening. All terrariums should be placed in well-lighted positions during the day, but at night they may serve as ornaments on the mantel, bookcase, or table.

Dish or bowl gardens can be conversation pieces in any home. You don't even have to be a succulent enthusiast to include one or two dishes in your living room or any other room in the house. They fascinate both young and old. To make a dish garden use any kind of flat dish made of porcelain, plastic or metal. It can be of any size, but the most popular dishes are from ten inches to fourteen inches across. Natural containers like sea shells, cactus wood skeletons and pneumatophoric objects (cypress knees, etc.) are worthwhile to consider if their depth will allow for a handful of soil. The best containers are quite shallow, two or three inches in depth.

The first step after choosing a container is to cover the bottom with about a half inch layer of gravel and upon it place a few sticks or chips of charcoal to keep the soil sweet. A handful of good porous soil is then added, and into this the plants and rocks are firmed in place. Rocks simulate actual habitat conditions and often help in anchoring the plants in shallow containers.

The planting of the dish garden is, of course, a matter of individual taste; however, some knowledge of related plants should be had. A florist-bought dish garden often is a hodge-podge of unrelated plants, especially when aroids, ivy and ferns are used with succulents. Desert plants cannot compete with jungle plants or vice versa. If you water too much the desert plants rot and if you don't water enough jungle plants wither and die.

When making a desert dish garden, use only cacti and succulents that require infrequent waterings. Do not overcrowd the dish with plants because a simple garden, planted with artistic taste, will remain a pleasure for months. Seedlings or dwarf plants should be used since they can easily accommodate themselves to one small container. After the plants are arranged and planted, sprinkle lightly with water and then spread sand, gravel or limestone chat on the surface. Colored sand is used frequently by the florist to create a painted desert effect.

PROPAGATION OF SUCCULENTS

CUTTINGS:

Most succulents propagate very easily, either by stem or leaf cuttings. In some species, certain plants will produce young viviparously along the leaf margins even while the leaves are still attached to the mother plant. When the leaf drops to the ground the attached "babies" immediately take root and grow to maturity. In the Crassulaceae almost every species, including such well known genera as Crassula,

1. *Bryophyllum daigremontianum* plantlets growing on leaf margin. 2. Gasteria leaf sprouting. 3. Peanut cactus, which can be propagated from each joint. 4. Opuntia fruit propagation.

Bryophyllum, Echeveria, Kalanchoe, Sedum, Graptopetalum and many others, can be propagated readily from leaves. In most instances care should be exercised in removing the leaf with the "eye" (bud) attached, but since the axillary bud is in the base of the leaf in many succulents and the leaves often detach themselves on the merest touch, the operation is simple. *Kalanchoe beharensis* can be propagated from leaves by merely slitting the plush-like leaf and laying it on top of the soil or sand, just as is done with some Begonias. In the Cactaceae the well-known Organ Pipe, *Lemaireocereus marginatus*, and the Bishop's Cap, *Astrophytum myriostigma*, can be propagated from stem ribs alone. Opuntias develop young shoots from small pieces of detached joints as long as at least two areoles are present. An areole is a specialized organ in the Cactaceae, corresponding to a node on other plants, from which leaves, branches, and flowers emerge. It is usually round, minute to large, usually filled with felt, wool, bristles, hair or spines and arranged in symmetrical fashion on the surface of a joint.

Generally, any portion of a cactus and succulent can be cut off, treated and forced to produce new plants. The stem should be cut at the narrowest point possible. The cut surface should be allowed to dry and form a callus before it is placed in the sand or sandy soil for rooting. Plants form a callus on a cut surface when exposed to the dry air for several days or weeks depending upon the size of the cutting. Larger cut surfaces will require a longer length of time to heal. Cuttings need not be watered immediately after placing in sand. The sand, however, should be slightly moist, though not wet. It is best to withhold water for at least a week and then apply it sparingly until there is a sign that the cutting has taken hold. Indication of this will be apparent at the growing tip or at a branch bud somewhere along the stem. If for any reason decay appears cut the slip back to the living tissue and allow it to callus over again.

Cuttings, especially the slender-stemmed varieties, should be shielded from too much sun. Pure sand has the property to produce new roots readily but, since the rooted cutting derives no nourishment from it, it should be carefully transplanted to soil soon after roots have formed. In transplanting the cutting, care should be exercised not to injure the root system. Transplant into moist soil but do not water after planting until the roots have become established.

SEED:

Cacti and other succulents are easily grown from seed. Even though a great deal of patience is required for seedling culture, it is rewarding, for a more fascinating pastime cannot be indulged in.

Packets of seeds of all kinds of succulents can be bought at nominal prices from seedsmen in this country and abroad. The seed can be sown at any time of the year provided greenhouse culture can be given the seedlings in the winter. In the average home where during the winter temperatures frequently fall below 70° F. at night and humidity is low, it is advis-

1. Material for seed propagation. 2. Germination of seeds. 3. Seedlings transplanted into flat.

able to sow the seed any time after the middle of April until the end of the summer season. For best results, a uniform temperature of at least 70° and no higher than 90° should be maintained around the seed pans. Many tropical varieties will probably do better at temperatures higher than 70°.

The seed should be divided according to its size and sown in separate pans or pots. Any container which can be made to drain freely can be used for the purpose; but ordinary flower pots are very satisfactory. Thorough drainage should be provided in the bottom of the seed pan in the form of a generous supply of potsherds or gravel; upon this base, soil should be sifted to within an inch of the top of the pot. Any good porous soil may be used, especially if it contains a mixture of screened sand, well-rotted leafmold, and garden loam in equal proportions. Before sowing the seed, firm the soil with a small wooden tamper. Fine seed need only be broadcast, but the larger seed such as that of Opuntias, Stapelias and Euphorbias should be spaced in rows, giving each seedling a chance to develop after germination occurs. Seed of the other succulents, as a rule, is never covered, except the seed of the larger varieties which may be spread lightly with a coating of sand or sandy soil. It will be found practical to add a light covering of fine gravel over all the seed sown, simply because it will act as a protective blanket from too rapid evaporation and as a support for the tiny plants. After the seed is sown, the soil must be watered by immersing the container in a pan of water, permitting the moisture to seep to the top. Avoid watering from above since the seeds may be floated away unless a very gentle mist-like spray can be created. Care should be exercised to keep the seed and seedlings moist but not soaking wet. The seed pans must never be allowed to dry out. A single watering by immersion will usually suffice for five to seven days, depending upon the conditions maintained around the containers.

After the seedpans have been moistened, a white-painted glass cover should be placed over them and the pans set in a well-lighted position in the greenhouse, in the window, or under fluorescent light. The glass lid helps to maintain an even temperature and prevents the soil from drying out too rapidly; and, as well, it shields the young plants from the direct rays of the sun. As fresh air is very essential, especially in checking the growth of fungus growth which may make its appearance (unless soil and seeds are sterilized), it is important to remove the cover for at least an hour each day.

Most seed, especially of Stapelias, Mesembryanthemums, and the like will germinate within a week or fortnight; other seed may take a month or several weeks. When there is no sign of germination within five months, it is an indication that no or very little germination will occur. It is best to discard the seed and try again.

Early transplanting is not necessary unless the tiny seedlings begin to crowd each other. The plantlets may be transplanted into flats or larger pots, but care must be taken not to

injure their fine roots. It is advisable not to water the transplanted seedlings for at least two days in order to safeguard against the possibility of bacterial rot which might result from accidental injury to the rootlets during the shifting process. Also keep the newly-transplanted plants in a shady location for a few days before subjecting them to strong sunlight. Frequent shifting is to be avoided, since the procedure will not necessarily speed the growth of the individuals. Some succulents grow fast, others very slowly. Cacti, as a rule, do not require as frequent transplanting as do other familiar succulents, such as Mesembryanthemums, Aloes and Agaves.

GRAFTING:

Another very interesting method of successful propagation and one that is recommended to those who seek the unique in plant culture is plant grafting. The inexperienced person usually becomes discouraged or may not even attempt this experiment, because it seems difficult of accomplishment. Truly, grafting is an art, but it is by no means difficult to execute if a few simple and essential rules are observed.

By grafting, it is possible to unite two separate and distinct plants and make them grow as one. There are several good reasons why grafting of succulent plants is encouraged. It speeds the growth of those plants which are naturally slow-growing; it hastens smaller seedlings to maturity; it is the means of preserving rare species which might be lost through decay; and it insures a good crop of flowers on plants which seldom bloom when grown on their own roots under artificial cultivation.

Cacti, Euphorbias, and Stapeliads are generally used for grafting, because their stems are full of sap, thereby making them excellent for unions. Other succulents, however, can be used almost as successfully. Only related forms can be grafted, such as cacti on cacti, or spurges on spurges.

All slender-stemmed varieties lend themselves to cleft-grafting, while the thick, globose types require a flat graft. Both of these methods are of simple operation. In cleft-grafting, the stock should be cut to a desired height, usually six to twelve inches, and a slit made at the top with a clean, sharp knife or razor blade. The scion is cut at an angle on both sides to form a wedge, and this portion is inserted into the slot of the stock. A thorn from a Pereskia or Opuntia is run through the united portions and finally the graft is closely wrapped with twine to prevent the slit from drawing apart.

When using the flat graft, both scion and stock should be the same width at the contemplated union. After selecting the two plants, it is only necessary to make a smooth, flat cut on each individual and then to set the scion upon the cut surface of the stock. To hold the two plants in position while they are knitting together it is advisable to run binding twine over the graft and under the pot or to make use of any other holding device in order that a perfect union may be realized. Freshly-grafted plants should be set in a moderately warm place in the shade, so that the cut surfaces may grow together firmly and evenly.

Cleft grafts: 1. *Aporocactus flagelliformis* on *Hylocereus undatus*. 2. *Zygocactus truncatus* on *Selenicereus pteranthus*. 3. Flat grafts.

PLANT FAMILIES WHICH HAVE SUCCULENT MEMBERS

CACTACEAE (CACTUS FAMILY)

THE Cactus family is, without doubt, the most remarkable and outstanding of all the succulent plant groups. Its more than two thousand species and varieties, since they are all indigenous to the Western Hemisphere only, are truly more American than all the rest of the xerophytes (dry-climate plants). A Rhipsalis has been found in Africa but whether it is really a native is still a conjecture. Yuccas, Agaves, Echeverias and several other dry-loving plants likewise claim American citizenship, but they are only small groups within their families which have relatives in other parts of the world. Only the Cactus family is the All-American family among the Succulents! However, their popularity has carried them into the homes of every land on this globe. Cacti have escaped from cultivation and have established themselves so securely in the dry regions of Africa and Australia that they have become a great nuisance for everybody concerned. So, too, have they become so extensively naturalized in Europe, Asia, and Madagascar that they can hardly be distinguished from the native flora.

The fascinating Cactus family is best divided into three distinct tribes each of which is subdivided into subtribes, genera, subgenera, species and varieties.

The first of the three tribes universally recognized in the Cactus family is the Pereskia tribe or *Pereskiae*. Members of this tribe, numbering about twenty species, are assumed to be the most primitive of the cacti.

For the most part they are woody and leafy trees, shrubs, and vines which do not in the least resemble cacti as we generally know them. Many of the arborescent Pereskias could easily be mistaken for Lemon or Apple trees. However, since they bear areoles from which spines, branches, and leaves arise, they are *true* cacti. The areole is the distinguishing feature of every cactus plant. These areoles are scattered over a plant body in more or less symmetrical fashion and correspond to the places on the branches of a tree from which other branches, leaves and flowers grow. The foliage of Pereskias is mostly non-succulent, deciduous or permanent. Their flowers are stalked and often grow in clusters. *Pereskia aculeata* is the best known member in the tribe and was cultivated in England as early as 1696.

The second tribe, the Opuntia tribe or *Opuntieae*, best displays the evolutionary trend from the preceding group which can easily be followed in its eight or nine genera. Glochids are the distinguishing feature of the second tribe. These are tiny barbed bristles which fill the areoles and cause so much discomfort to the person handling the plants. These glochids or "bundles of tiny spines" are easily dislodged from the plant, but are withdrawn with difficulty from clothing or flesh. The genus *Pereskiopsis* becomes the second evolutionary step up in the Cactus family. The trees and shrubs

are very similar to *Pereskia* but must be excluded from the first tribe because they bear glochids. The most famous members of the Opuntia tribe are the "Prickly Pears" and the "Wicked Chollas." The former are characterized by flattened leaf-like joints or pads (branch sections), while the latter possess cylindrical stems. Opuntias have the widest geographical range of any cactus group. They can be found in Canada, the United States, Mexico, Central America, most of the warm Western Hemisphere islands, and extend to the southernmost tip of South America.

The third tribe, the Cereus tribe or *Cereeae*, is the largest of the three. It contains the darlings of the Cactus family, ranging from the dwarf to the gigantic, and likewise it is the most complex in its entirety. There are no glochids in their areoles, the plants are usually leafless and the flowers, as a rule, possess definite tubes. Over one hundred genera are included in this tribe and nearly a thousand species. The showiest and most brilliantly colored flowers grow from the highly succulent stems of the Cereus tribe. Many bloom for only a few days, some for only one night, and few for a few hours.

Although the Cactus family is very rich in varieties of shape, form, color and size, the genus Mammillaria is probably the most popular among the amateur cactus fans. Its members are, for the most part, small plants with simple or often clustered cylindrical or globular bodies, conspicuously covered with numerous tubercles or nipples. The nipples are capped with areoles,

Epiphyllum × "Prof. Ebert." A magenta-flowered orchid cactus suitable for small pots.

from which spring forth delicate or strong spines of various sizes. The flowers, however, do not arise from the areoles but are rather borne from the usually hairy or wooly axils of the old tubercles near the tops of the plants. The flowers are comparatively small, more or less campanulate, yet they make up for their diminutive size by being produced in abundance in the form of a dazzling crown of red, pink, white, yellow or purple. The beauty of the plants is further enhanced by the colorful clavate (club shaped) fruits, which in some species, appear at the same time as do the flowers.

The neophyte or beginner, who is contemplating a collection of cacti, should acquaint himself with a book or two on the subject before purchasing a lot of unwanted or difficult plants. There are over two thousand kinds of cacti with varying good and bad qualities. Some are thimblesized, others veritable giants; some are slender, twining, creeping or prostrate,

while others are shabby, weedy and even obnoxious, there are varieties that will test your skill as a gardener. By studying good illustrated and descriptive catalogs and reading such instructive books as my own CACTUS GUIDE (Van Nostrand, 1956) and CACTUS PERSONIFIED (Wildcrafter Publications, 1959), one can get a fairly clear idea of what types of plants will be best suited for a particular room, porch, or garden. Both of these books can be purchased at the Missouri Botanical Garden.

EUPHORBIACEAE (SPURGE FAMILY)

The Euphorbs or spurges constitute a very large family including herbs, shrubs, and trees of the most varied aspect and are found in most parts of the world. The plants are characterized by a milky juice, "latex," and the flowers are often imperfect, lacking petals. The desert Euphorbs are more or less succulent in habit and many are strikingly similar to cacti. Some are dwarf leafless shrubs and others become giant trees sixty feet or more high. These desert spurges survive by reason of their power to store water and nourishment not only in their roots, but some in their main trunks and branches as well. Many of the strange shapes are paralleled among the cacti and consequently many people usually mistake these spurges for cacti. Most of the succulent Euphorbias are of African origin, although a few will be found in India and Arabia.

King Juba of Mauritania (ca. B. C. 25–18 A.D.) was the discoverer of a plant to which he gave the name of *Euphorbia* in honor of his physician, Euphorbus.

The genus *Euphorbia* numbers around 2,000 species and these are herbs, shrublets, shrubs or trees of most variable habit, herbaceous, woody or succulent, and spineless or spiny. South Africa is the home of about two hundred succulent species; and all of them are appealing. The Missouri Botanical Garden has a rather large and interesting collection, most of which were grown from seed about twenty-five years ago.

It would be impossible to adequately describe a representative number of spurges in this bulletin and again the writer would like to recommend a treatise which is very valuable for the collector. The two-volume work is White, Dyer and Sloane's THE SUCCULENT EUPHORBIEAE published in 1941 by the Abbey Garden Press. This is the most extensive monograph on the South African spurges—well illustrated, with good descriptions, and full of historical information.

One of the most popular spurges is *Euphorbia Tirucalli*, at one time thought to be a producer of rubber but the coagulum contains too much resin. This spurge has an odd and engaging form of growth and is easy to cultivate. In fact, few plants can be naturalized more easily in new surroundings. The plant is composed of slender green cylindrical branchlets and it early becomes tree-like up to thirty feet tall. Along the Atlantic

seacoast in Florida it is frequently used as a hedge.

Euphorbia bubalina is another favorite. It is a succulent shrub, spineless, and easily propagated from cuttings. When planted in a greenhouse it will flower and seed regularly and seedlings will appear everywhere.

The most prolific spurge in collections is *E. lactea* from the East Indies. It produces branches that are more or less triangular in cross-section, the three ridges along the side of the stem have wavy margins and the central part of the stem between the ridges is white-mottled. A crested form of *E. lactea* is highly prized and is often called the Frilled Fan Spurge. Another common form often found in most collections is the Crown of Thorns, *E. splendens*, native to Madagascar. It grows into a small bush and bears green leaves and flowers almost the year round. Still another choice is *E. pseudocactus*, with highly mottled stems.

The genus *Pedilanthus* is strictly American, found mostly in Mexico. It has cylindrical stems and branches, at the tips of which are produced colorful inflorescences in the shape of slippers, hence the common name "Slipper Spurge" for the plants. The curving branches are frequently used in floral arrangements, especially when the colorful crinkly foliage is present.

ASCLEPIADACEAE (MILKWEED FAMILY)

This is a most interesting family of about two thousand species scattered in all parts of the world. It is known as the Milkweed family because all plants produce a milky, semi-milky to slimy watery juice in their cells. Only the Stapeliads and Ceropegiads are highly succulent and these occur mostly in Africa.

The Stapeliads grow in simple or multiple clusters and are characterized by short, mostly toothed, fleshy stems on the order of dwarf cacti of the Cereus group. The flowers are campanulate to starshaped with often lurid colors. They also produce a more or less fetid odor which serves as a lure for desert flies—the principal agents for their pollination. None of the Stapeliads are found in the Western Hemisphere. They occur on the African continent from the Sahara wasteland to the Cape of Good Hope. In Asia they are usually confined to India, Afghanistan, Arabia, Ceylon, Palestine and some of the islands of the Indian Ocean. A few varieties are native to Spain. The Stapeliads consist of about twenty genera, the best known being *Stapelia, Caralluma, Duvalia, Huernia, Hoodia, Piranthus, Tavaresia* and *Trichocaulon*. In order to study them and gain much valuable information the reader is referred to White and Sloane's THE STAPELIEAE in three volumes published by Scott Haselton in 1937.

The Ceropegiads contain mostly vining leafy succulents although a few are erect and rigid in growth, forming clumps. The flowers may be described mostly as lantern-like. One of the

most popular Ceropegiads is *Ceropegia Woodii* which has small silver-mottled heartshaped leaves or string-like stems. *C. Sandersonii* possesses much larger and thicker leaves and its flowers resemble parachutes. *C. stapeliiformis* is a leafless climbing or clambering species with long thin cylindrical stems with mottled markings. The peculiar white flowers have brown edges.

Another familiar milkweed is the Wax Plant or Hoya.

LILIACEAE (LILY FAMILY)

There are many kinds of desert lilies of succulent or xerophytic habit, notable among them the Aloes, Haworthias, Gasterias, Yuccas and their immediate allies. The Lily family is a large one, found in many parts of the world but all its members are not classed as succulents. The Yuccas are mostly xerophytes. These plants play an important part in the development of home grounds in the southeastern sections of the United States, particularly in Florida. In warm, sunny California these slender green dagger-lilies are frequently utilized in foundation plantings and look particularly effective against the Spanish type of architecture. Tall, arborescent Yuccas often stand as sentinels above the low adobe ranch houses of the Southwest. In the colder regions, above the Mason-Dixon line and throughout the Midwest, these plants serve as backgrounds in the rock garden, while the more tender varieties are used as ornamentals in summer gardens and conservatories. The few stemless or short-stemmed hardy members often are seen in cemeteries, along railroad embankments, in abandoned fields and waste places. Almost all of the subtropical species are adaptable to pot culture when in their young stage, making excellent window plants.

At present there is no modern work that deals with all the Yuccas, but Susan D. McKelvey's YUCCAS OF THE SOUTHWESTERN UNITED STATES in two parts will be of invaluable aid to Yucca lovers. The first part was published in 1938 and the second part in 1947.

Aloes constitute one of the big groups of succulents in the Lily family. The leaves are very fleshy and are usually crowded into a dense rosette. Some Aloes do not produce a stem, while others assume tree-like proportions. The majority of them can be placed outdoors in summer in a sunny place. In California and other warm regions these plants are used as outdoor adornment in beds, foundation plantings, in borders and as screens. Aloes require a rich sandy soil and good drainage. They grow very readily from seed but since they hybridize so easily propagation by seed does not always produce true species. Many varieties produce an abundance of offsets which can be taken off and potted individually. Aloes are found mostly on the African continent. In South Africa, alone, over one hundred species are recorded. *Aloe vera* possesses medicinal properties and has been used from time immemorial for purgatives. In recent years it has found favor as a

emedy for burns, particularly those aused by X-ray and radium. Here gain I recommend specialized litera- ure for those who wish to study these articular plants. The best work is THE ALOES OF SOUTH AFRICA by Gilbert W. Reynolds, published in 950, and containing over 500 pages ith many black & white as well as olor plates.

Closely allied to the Aloes are Gas- erias and Haworthias which find avor as window plants. Though they re much smaller, they readily hybrid- ize with Aloes. The Gasterias usually possess two-ranked, tongue-shaped leaves and the flower spikes exhibit tubular reddish flowers with green tips. Haworthias are very close relatives and are very diminutive succulents, often referred to as "the darlings of the succulent clan." They are grown mostly for the symmetrical rosettes of dark green warted leaves or bright green translucent foliage. Haworthias require shallow pots. They flower almost any time, although the flowers are often unattractive.

AGAVACEAE (AGAVE FAMILY)

Agaves have long been considered ttractive plants for the outdoor gar- en. They prefer heavy soil that is ell drained in a sunny location. lthough strictly American in origin he plants have been naturalized in ndia, the Philippines, Africa and any other tropical regions. The ants are erroneously but popularly lled "Century Plants" because it was ng thought that it requires 100 years r the plants to bloom. This is far om being true. Some Agaves bloom nually; others may take eight to enty-five years to reach maturity, t since in collections the plants may t bloom for two or three genera- ons the fallacy has arisen and has en perpetuated. The leaves of the gaves all possess fibers and some of e species such as *Agave sisalana* and *fourcroydes* produce the *sisal* and *nequen* of commerce.

The leaves of the Agaves grow in re or less rosette fashion. They are ually very firm, hard, with margins entire or toothed and usually with a strong spine at the tip. Some of the Agaves are dwarf but others attain gigantic proportions. Most of them sucker freely and are excellent pot specimens although they often outgrow their containers in no time. *Agave atrovirens* is the source of *pulque*, a most potent drink in Mexico; other species are used to make the distilled drink, *tequila*.

The flowerspike resembles an asparagus shoot and it grows fast, in some species assuming tree-like proportions up to twenty feet high and several inches in thickness in several weeks. Some species die after flowering but innumerable offsets are produced before the plant's demise. Formerly Agaves were included in the Amaryllidaceae or Amaryllis family but in recent years a separate family was proposed for them and is now universally recognized. There are no up-to-date popular books on Agaves available at present in the English language but

botanical libraries do possess classics by such specialists as William Trelease, Baker and Rose. This is one of the most difficult plant groups to revise and anyone attempting a revision of Agavaceae will have many problems to solve.

AIZOACEAE (FIG-MARIGOLD FAMILY)

The genus *Mesembryanthemum* was established by Linnaeus in 1753 and it contained a complex assemblage of stemless as well as shrubby plants. The genus remained intact until 1921 when a wholesale division was started by Dr. N. E. Brown in *The Gardeners' Chronicle*. Today at least a hundred different genera are recognized. The vast number of succulent species of the Fig-marigold family are inhabitants of South Africa's driest regions and the plants have adapted themselves to these conditions by storing up water for the dry season and have taken the many odd forms which make them so interesting.

The Mesembryanthemums are divided into two groups: the shrubby or carpeting members such as *Carpobrotus, Delosperma, Dorotheanthus* and *Drosanthemum* all of which produce veritable carpets of beautiful daisy-like flowers in various colors; and the "Stone Plants" such as *Pleiospilos, Lithops, Conophytum* and *Gibbaeum* which are usually stemless and can hardly be distinguished from the stones among which they grow. They, too, have lovely flowers in various shades. In this same category are included the "Windowed Plants" like *Fenestraria* and *Frithia*, which have retired into the ground and receive their light through the flat translucent tops. The stemless Stone Plants generally are harder to maintain because growers tend to overwater them. Pots too large or too deep should be avoided and the containers must be of porous earthenware. Transplanting is not necessary and the plants can be kept in the same pot for several years. The less the plants are disturbed the better. All Mesembryanthema prefer a sunny location and do excellently in greenhouses although healthy specimens can be grown on the windowsill as well.

Lithops or Stone Faces from South Africa. Photo by Ladislaus Cutak.

The stemless Mesembs often present the phenomenon of mimicry in their native haunts. When not in flower some of these plants are hard to detect. The Lithops resemble curiously-shaped pebbles and are commonly known as "Pebble Plants"; the Pleiospilos present succulent leaves of the color of weathered stone and when not in flower look like lumps of stone, hence the common

name "Stone Plants" or "Split Rocks." The Titanopsis present leaves in tiny rosettes and their surface is covered with irregular excrescences that look exactly like whitish fragments of limestone. There are a number of books dealing with specific plants of the Fig-marigold family but a general book useful to the fancier is MESEMBRYANTHEMA by N. E. Brown, A. Tischer and M. C. Karsten, published in 1931.

CRASSULACEAE (STONECROP FAMILY)

The Stonecrop family, like the cactus, is generally classified as all-succulent and the botanical name literally means thick or succulent from the word *crassus*. The family is world-wide and contains both hardy and tender plants of variable habit and form. It is also a very large family and is conveniently divided into groups such as the Sedoids, the Kalanchoids, the Sempervivoids, the Echeveroids and many others.

Most plant lovers are acquainted with Sedums and Sempervivums which are wonderful subjects for any rock or wall garden. These two groups are perfectly hardy although Sedum also contains many tropical species. There are more than five hundred species of Sedum classified but many of these are not known to the cultivator. *Sedum acre* is one of the commonest of hardy low-growing mat types as is also *S. hexangulare*. Both of them produce yellow flowers in the summer months. The home grower will probably be interested in the tropical kinds, most of which emanate from Mexico. These are highly colorful and shrubby for the most part. The Golden Sedum, *S. Adolphii*, with pointed yellowish leaves and white flowers, makes an excellent pot or basket plant. The thick leaves break off easily and produce young plants readily. One of the most colorful Sedum is *S. rubrotinctum* (the *S. guatemalense* of horticulture) with deep green, very shiny leaves which turn a bright cherry red when exposed to the sun. It is a great favorite in California.

The Sempervivums are mostly European and will withstand freezing weather. They produce symmetrical rosettes of dark green often tinged purple at the tips. Known as Houseleeks, these plants often are grown on roofs of huts in Europe. In American gardens, Sempervivums are grown in rockeries and strawberry jars. One of the oddest is *S. arachnoideum* which produces white cobwebby hairs amongst its small rosettes. A wall completely covered with these spider hen & chicks is really a sight to behold! The tender Sempervivoids are mostly found in the Canary Islands and are usually classified as Aeoniums. Most of the Aeoniums are sturdy-stemmed, shrubby species producing leaves in a rosette and panicles of showy yellow flowers in pyramidal fashion. An excellent pot or basket plant is *Aeonium Haworthii* with green leaves edged with red. One of the most remarkable is *Ae. tabulaeforme* with large plate-like rosettes. Other more dainty Sempervivi are

Aichryson, Monanthes and *Greenovia.*

In the Echeveria group you will find some of the most colorful leaf forms as well as colorful flowers. The Hen-and-Chick plants are mostly found in Mexico and often look like small cabbages. *Echeveria secunda* is a familiar species often used in bedding as well as in strawberry jars. Some species are glaucous, others hairy, and still others glabrous. Some are dwarf and nearly stemless, others branching and shrubby. Closely related to the Echeverias are Pachyphytums which readily hybridize with them. Dudleyas also belong to this group and are characterized by extremely white-powdered leaves; *D. pulverulenta* the best known Dudleya, is sometimes popularly called "Chalk Lettuce."

The Kalanchoids have become very popular in the past few years. The two well-known genera, *Kalanchoe* and *Bryophyllum,* are grown extensively in America, both as pot plants in the North and in outdoor gardens in the South. The Kalanchoes usually have upright or erect flowers while Bryophyllums have pendent flowers and the leaves often give rise to tiny plantlets along the crenations. *Bryophyllum daigremontianum* and *B. tubiflorum* propagate prolifically and often become a nuisance on a greenhouse bench. *B. Fedtschenkoi* has been frequently used in flower arrangements. *B. pinnatum* is naturalized in all the more or less tropical parts of the world. The Bryophyllums are mostly natives of Madagascar. Kalanchoes contain over two hundred species and are more widely scattered over the warmer parts of the world. *Kalanchoe tomentosa* is a very beautiful plant with narrow, gray, brown-edged leaves. *K. beharensis* grows into a medium-sized tree with large, broadly arrow-shaped leaves. Many of the Kalanchoes produce beautiful flowers which make them extremely popular as house plants. *K. flammea* and *K. Blossfeldiana* belong to this category and their brilliant flowers are borne in large, compact, somewhat flattened clusters.

The Cotyledon group contains quite small plants such as *Adromischus* and the strong-growing, bold-appearing plants such as *Cotyledon.* The Adromischus make ideal pot plants and although only a few species are available all are worth cultivating. Cotyledons are mostly South African succulents and are quite variable in habit, in the size and shape of the leaves, and in the color of their flowers.

The Crassulas number over two hundred species and form one of the most interesting groups in the Crassulaceae. The abundance of forms available is enough to intrigue anybody. Some Crassulas have the appearance of club mosses, others become large shrubby plants, a few form flat rosettes, and still others form dense mats. *Crassula argentea* is the well known Jade Plant and in its native home will often attain a height of twelve feet. It is used extensively in bowls and dish gardens.

Miscellaneous Succulents

The preceding plant families contain a preponderance of succulents but there are still many more with lesser amounts. In the *Portulacacea* or Purslane family there are two highly succulent genera and these include *Anacampseros* and *Portulacaria*. The former are interesting and fascinating little plants while the latter is a shrubby ornamental frequently found in collections and used in dish gardens and arrangements.

In the *Compositae* or Daisy family only three genera have succulent species and these are *Kleinia, Othonna* and *Senecio*. *Kleinia articulata* is probably the most familiar of the group. It is composed of short joints which resemble a tallow candle. *K. radicans* is a low creeping form and *K. tomentosa* is most unusual in that it is a truly white plant due to the heavy covering of white, felt-like tomentum on the leaves. Still another unusual one is *K. pendula* which resembles a mass of writhing snakes. Commonly it is known as the "Inch Worm." *Othonna crassifolia* is the well known "Pickle Plant," so called because of the small pickle-shaped leaves strung on long slender stems. Bright yellow daisy-like flowers are displayed by Othonna throughout the season.

One would not ordinarily expect to find succulent species in the Vitaceae or Grape family, yet there is the genus *Cissus* with about five members. Two of them are vining or clambering types with angled jointed stems; the other three have greatly enlarged bases and are more or less branched at the top. In the *Apocynaceae* or Dogbane family the highly succulent genus, *Pachypodium*, presents a fantastic group of plants with tuberous-thickened stem-bases looking like inverted carrots. The genus *Adenium* is even more bizarre with its thickened, contorted stems.

Among the Pelargoniums in the *Geraniaceae* a few succulents are found. The oldest in cultivation is *P. echinatum* with round green spiny stems and dainty light colored flowers on long flowering stems. It grows easily from cuttings but the plants require little watering especially in the dormant season.

The *Commelinaceae* or Wandering Jew family contains a few succulent species, the best known being *Tradescantia navicularis* from Peru. Then there is *Cyanotis somaliensis* and some of the Setcreasias are classed as semi-succulents.

The *Piperaceae* or Pepper family is noted for a number of succulents, chief among them Peperomias or Pepper-elders. *Peperomia dolabriformis* is a truly desert succulent, with thick, hatchet-shaped leaves. Others such as *P. tithymaloides* and *P. obtusifolia* can be classed as semi-succulents.

Strombocactus disciformis.

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